Don't Waste This Stuff!

Water-Treatment Residue May Help Ease an Environmental Concern

ARS studies have found that residue from water-treatment processes—often discarded as waste into landfills—may make good soil treatments for preventing phosphorus loss in runoff from agricultural lands.

At ARS's Coastal Plains Soil, Water, and Plant Research Center in Florence, South Carolina, soil scientist Jeffrey M. Novak is studying an alum-based water-treatment residual that increases soil's capacity to adsorb (bond) phosphorus, a vital plant nutrient. Increased adsorption of phosphorus would curb its runoff, which can lower the oxygen content of water bodies and spoil the taste of drinking water.

Manure is laden with phosphorus, making agricultural facilities such as large livestock production operations potential sources of phosphorus pollution. Farmers commonly spread manure on their lands, a practice that often results in excess phosphorus being applied. But transporting the manure off site is cost-prohibitive.

Novak says the studies—being done in collaboration with Ray Bryant, research leader at ARS's Pasture Systems and Watershed Management Research Unit in University Park, Pennsylvania—may benefit states along the nation's mid- to southern Atlantic seaboard. "This region has sandy soils that generally adsorb less phosphorus than finer-textured soils," says Novak.

High Phosphorus-Binding Capacity

Novak says chemically binding phosphorus into water-insoluble complexes by using water-treatment residuals containing iron-oxide, aluminum-oxide, and hydroxide may become an important management practice. "The alum-based water-treatment residual this research focuses on has a high phosphorus-binding capacity."

Separate research—conducted on wheat by agronomist Eton Codling at ARS's Animal Manure and Byproducts Laboratory in Beltsville, Maryland—has found that the treatment has no negative effect on plant absorption of phosphorus once plant roots grow beyond a 6-inch-deep layer the treatment creates in soil.

In previous independent studies, phosphorus runoff was reduced through direct application of the alum-based residual onto fields recently treated with manure. "But we set out to actually bind more of the phosphorus in soils that, like sandy coastal plain soil, have a low adsorption capacity," says Novak.

The lab tests "produced striking results," he says. "We were able to increase phosphorus-binding potential four- to fivefold, as compared to untreated sandy soil. This suggests that incorporating the residuals into sandy soils has great potential as a chemical-based, best-management practice to reduce off-site phosphorus transport."

The lab studies will be repeated and additional research done in the field over the next 2 years. If successful, this use for waste from the water-treatment process not only could get rid of the waste, but would also hold phosphorus on the land until a crop can use it.—By **Luis Pons,** ARS.

This research is part of Water Quality and Management (#201) and Soil Resource Management (#202), two ARS National Programs described on the World Wide Web at www.nps.ars.usda.gov.

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Alum-based drinking water treatment residuals have a high ability to bind phosphorus because they contain high concentrations of aluminum oxide and hydroxide groups.